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ABSTRACT

Recent studies indicate that the principal is key in planning for change and that innovations can succeed when the principal as change facilitator shares responsibility with others--assistant principals, teachers, and parents. This paper discusses two areas: (1) student learning enhanced through cultivation of critical thinking skills; and (2) teacher effectiveness promoted by restructuring training programs and by teacher evaluation. The Educational Testing Service Project STACI (Systems Thinking and Curriclum Innovation) uses computer simulations to teach students advanced problem-solving techniques, stressing the interconnectedness of human events. STELLA (Structural Thinking Experimental Learning Laboratory with Animation), the software running on Apple's Macintosh, couples varied content from the sciences and social sciences with higher order thinking skills to locate common elements. The Costa model and other research are also described. To improve teacher effectiveness, the Holmes Group has developed an innovative proposal for overhauling schools of education. Recommendations include eliminating undergraduate teacher training; strengthening prospective teachers' liberal arts background; designing a three-step career path; establishing professional development schools paralleling teaching hospitals; and thorough evaluation of teachers in writing, speaking, and delivery style. Relationships between teacher scores on standardized measures (or grade point averages) and student achievement or principal ratings have not been clearly established. Imprecise definitions of critical thinking and teacher effectiveness have contributed to uncertain or contradictory resarch findings in both areas. (47 references) (MLH)

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Effective Principals Making the Difference

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Table of Contents

Introduction 1

Student Learning through the Cultivation of Critical Thinking Skills 3

Teacher Effectiveness and Teacher Evaluation 11

Innovations and Evaluation 16

Conclusion 18

General References 20

Selected ERIC Documents 23

Dr. Claire C. Irwin

What Research Tells the Principal about Educational Innovations

> Innovation is the introduction of any new idea, method, or device to improve some aspect of the educational process.
>
> ---John Martin Rich, Innovations in Education Reformers and Their Critics, 1988

Introduction

Public education today is under scrutiny and attack from many quarters of American society. Formal criticism and recommendations for change have appeared in a flurry of reform reports such as those issued by the National Commission on Excellence in Education (A Nation At Risk), the Educational Commission of the States, the National Science Board Commission, the Twentieth Century Fund, and others. To these must be added the voices of John Goodlad, Theodore Sizer , Mortimer Adler, and Ernest Boyer.

At issue are student achievement, motivation, and intellectual performance, moral development, values commitment, violence, weapons, drug abuse, and drop out rates; the role of computers; bilingual and multicultural education; teacher training and effectiveness. To name a few. Changes through innovations are needed to bring about school improvement. This takes time.

Recent studies have demonstrated that the principal is key in planning for change, that innovations can succeed when the principal as change facilitator shares this responsibility with others--assistant principals, teachers, parents (Clausen).

There are so many dimensions of public education which have been addressed by reformers and so many attendant innovative practices, recognized nationally, that this paper will be sharply delimited to two

areas: (1) student learning enhanced through cultivation of critical thinking skills; (2) teacher effectiveness promoted by a re-structuring of training programs and by teacher evaluation.

In historical perspective, Ralph Tyler, director emeritus, Center for Advanced Study in the Behavioral Sciences, Palo Alto, notes that criticisms of education can be traced back as far as 1892, 1912, and in the Great Depression of the 1930s. He points out that in 1900, there was already a demand for students to develop critical thinking skills to deal with the barrage of political propaganda emerging in a complex society. Looking at the present, Tyler insists that students learn knowledges, skills, and attitudes necessary for experiencing a rich home and community life. Schools surely need to improve, but goals and needs are different in different schools--are local. The common element is time, usually six or seven years for a reform to take hold or for an innovation to take root. Thus many promising practices, not nurtured, nor evaluated are soon abandoned. According to Tyler, leadership for change ought to reside in the hands of the locals--the principal working together with teachers, students, parents must identify problems and agree upon possible solutions, creatively. Reforms from on high may provide cues, but do not necessarily work successfully at local levels. In short, the principal makes the difference.

Teachers are also the heart of the matter. Teachers teach what they understand and believe in and therefore are germane to school change. They must be active participants in innovative programs; must be given a chance to learn new procedures through staff development. Linkages here are crucial and in keeping with the diversity which American education represents.

Student Learning through the Cultivation of Critical Thinking Skills

The first aspect of this paper will deal with the national trend toward developing critical thinking skills in students across curricula. Synonymous with critical thinking are the terms "higher mental processes" and "higher order thinking skills" (the acronym H.O.T.S. is popular in the Detroit Public Schools). Although a pervasive educational objective, critical thinking remains imprecisely and differentially defined.

Some of the important formulations, key people, and research efforts as well as criticisms will be briefly summarized. More than thirty years ago, the Taxonomy Group (Benjamin Bloom and Associates) classified the higher mental processes into a hierarchy called the Cognitive Domain--Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Yet research has demonstrated that the larger proportion of secondary students may operate at the first three levels, but never reach thinking competency at the top three levels, regardless of subject matter.

According to Chaffee, critical thinking is a total approach to making sense of experience. A critical thinker is a person who is "truthful, open-minded, empathetic, questioning, active, autonomous, rational, self-critical, and flexible". In addition, a critical thinker can "analyze and solve problems; generate, test, and organize ideas; form, relate, and apply concepts; construct and evaluate arguments; explore issues from many perspectives; reason with concepts; see relationships; develop evidence and reason to support alternative views; exchange ideas systematically; apply knowledge to new situations; be aware of one's own thinking processes, and, at the same time monitor and

re-direct these processes" . Chaffee further identifies five skills crucial to developing sound reasoning: (1) developing an objective viewpoint; (2) clarifying an evaluative statement--differentiating between fact and opinion; (3) judging factual statements against data; (4) determining the validity of an argument; and, (5) testing out evaluative statements.

Researchers at the Educational Testing Service (E.T.S.), principally, Irving E. Sigel, subscribe to the premise that learning is an interactive process often stifled when teachers merely present facts in lecture without asking provocative questions which require higher order thinking skills. E.T.S. holds to the position that critical and creative thinking is indigenous to a variety of curricula. Various projects designed to enhance student thinking skills are being sponsored by E.T.S.

Under the direction of Ellen Mandinach, systems thinking is being investigated in Project STACI (Systems Thinking and Curriculum Innovation) which uses computer simulations to teach students advanced problem-solving techniques with emphasis upon the interconnectedness of human events. STELLA (Structural Thinking Experimental Learning Laboratory with Animation) is the software which runs on Apple's Macintosh. High school students are guided to understand the "dynamic nature of behavior over time--how variables or behaviors change and interact in a systematic way". Once students understand the nature of variables, they can formulate and test hypotheses through computer capabilities across subject matter (from the physical-natural to the social sciences).

Project STELLA is hailed as an innovative approach to chemistry studies (pollution) as well as to history (Spanish Civil War, the American Civil War, the Iran conflict) to locate common elements. Modules developed by teachers during training sessions at E.T.S. reflect a coupling of higher order thinking skills with varied content. The transfer of thinking skills will also be investigated. The experiment at Brattleboro Union High School, in Vermont, has won accolades. Apple's External Research Division has made arrangements for West Coast STACI teachers to have the STELLA software and the Macintosh computers (Focus, E.T.S., 1987 and ETS Developments, Fall, 1988).

Two investigators, Ennis and Costa have independently developed models which identify the hallmarks of critical thinking against which student intellectual prowess can be judged. The structure of the COSTA Model appears as TABLE 1.

The Ennis model sets forth twelve (12) aspects of critical thinking and twelve (12) additional characteristics:

1) Grasp the meaning of a statement.
2) Judge whether ambiguity exists.
3) Judge if contradictions exist.
4) Judge if a conclusion necessarily follows.
5) Judge the specificity of a statement.
6) Judge if a statement relates to a principle.
7) Judge the reliability of an observation.
8) Judge if an inductive conclusion is warranted.
9) Judge if a problem has been identified.
10) Judge if a definition is adequate.
11) Judge if a statement is valid.

12) Judge if something is an assumption.

Additional dispositions of critical thinking according to Ennis are:

1) Seek a clear statement of the thesis or question.

2) Seek reasons.

3) Try to be well informed.

4) Consider the total situation.

5) Try to remain relevant to the main point.

6) Keep in mind the original or basic concern.

7) Look for alternatives.

8) Be open-minded.

9) Take a position (or change a position) when the evidence and reasons are sufficient to do so.

10) Seek as much precision as the subject permits.

11) Deal in an orderly manner with the parts of a complex whole.

12) Be sensitive to others' feelings, levels of knowledge, and degrees of sophistication.

According to Levine, various projects for improving thinking skills have enhanced the performance of low achievers. Examples include "reciprocal teaching" and "reflective thinking", instructional alternatives that combine specific teaching tasks with immediate feedback and time for reflection. Working in small groups the teacher has 15 minutes of teaching time, after which the achievement of the group members is evaluated immediately. Learners raise questions, discuss problems, and share ideas about the lesson they have just experienced. A total of 35 reflective tasks have been developed. Each

Table 1
The Costa Model of Critical Thinking

	COMPONENTS			
HIGHER ORDER CRITICAL THINKING SKILLS	PROBLEM SOLVING	DECISION MAKING	CRITICAL THINKING	CREATIVE THINKING
Task	Resolve a Known Difficulty	Choose a Best Alternative	Understand Particular meanings	Create Novel Ideas/Products
Essential Skills Emphasized	Trans-formation Causation	Classifications Relationships	Relationships Trans-formations Causation	Qualifications Relationships Trans-formations
Yields	Solution Generalization (potentially)	Response	Sound Reasons Proof Theory	New Meanings Pleasant Products

meets five criteria: (1) It must be interesting to teach and to learn; (2) The content must be different from the usual academic curriculum; (3) The task must be small enough to be taught in 15 minutes; (4) The result must be measurable or directly observable; (5) The task must be self-contained, i.e., must include all the materials necessary for instruction. Other cooperative learning techniques include the Instrumental Enrichment approach developed by Reuven Feuerstein and his colleagues, the Productive Thinking Program, and the Chicago Mastery Learning Program.

Brandt emphasizes metacognition which means teaching about thinking. The aim of this approach is to get students to think about their thinking and to have them bring their "patterns of thinking" to a

conscious level. The evaluation phase of this thrust is demonstrated by the following types of questions:

1) What was I expected to do?

2) What did I do well?

3) If I did the same task over again, what would I do differently?

4) What help do I need?

Metacognition uses structured interaction to lead students to process information and become interested since discussion is rooted in experiential activities.

Ross recommends that folktales be used as a medium for teaching middle school pupils critical thinking. Such tales use what students already know. From this position they may be taught to reason, analyze, to evaluate and solve problems , even to create. Folktales provide built-in motivation. With familiar materials students learn to focus on thinking skills instead of mastering new content. Actually there is a dual purpose here--to re-enforce knowledge of their cultural heritage and to learn to apply thinking skills to literature.

Contee reports that when secondary reading classes stress critical thinking, the following improvements result: (1) attendance and classroom behavior improve; (2) the ability to write well-structured paragraphs improves; (3) students see a variety of relationships; (4) students gain confidence in approaching textbook materials and read efficiently for different purposes.

Studies of critical thinking programs appear to point to the following strengths and weaknesses.

---Critical thinking classes appear to be most successful when started in the elementary and middle schools and then continued on into high school.

---Critical thinking classes which use modern technological devices, such as video tapes, slides, motion pictures, and computers seem to achieve the best results.

---Student-teacher interactions are necessary to the success of critical thinking instruction. Dialogues between student and teacher must be established so that students can develop their own "representational competence" (Sigel) in appropriate social and physical environments.

---Formal summative evaluation of thinking skills programs should be delayed for at least two years to allow for changes in the thinking attacks and changes in behavior.

---Teachers often resist participation in critical thinking approaches since they perceive the consequences of such innovative approaches to be threatening to their jobs, salary determination, and traditional working patterns (Saretsky).

---Meeth sees critical thinking courses as posing a significant threat to the conception and status of the humanities. While students' cognitive skills may indeed be strengthened, there is frequently a lack of reference to the philosophical traditions of American and World culture. There is too little attention to the past, to cultural heritage, and to the long-term needs of students.

---If the following conditions exist, then school and system may encourage critical thinking innovations: (1) Will the community support innovative programs? (2) Are teachers flexible and ready to try out innovative approaches? (3) By academic background and professional training, are teachers flexible enough to accept innovation? (4) Is there any relationship between the level of support that a school receives from State and Federal sources and the adoption of innovative materials and ideas? (ERIC, ED 083 115).

Of interest is the book entitled Thinking in the Classroom which describes eight curriculum programs focused upon the teaching of critical thinking skills. Most programs stress an early start across subject matter. Some of these strategies are referenced below:

Philosophy for Children K-12

Matthew Lippman
Institute for the Advancement of Philosophy for Children (IAPC)
Montclair State College, New Jersey

CoRT Thinking Lessons K-12

Edward deBono
The Cognitive Research Trust
11 Warkworth Street
Cambridge, England

California Thinking Skills (CTS) 3-12

California Assessment Program 3-12
721 Capitol N. Mall
Sacramento, California 95814

Patterns of Thinking K-12
Illinois Renewal Institute, Inc.
200 E. Wood Street, Suite 250
Palatine, Illinois, 60067

In the area of tests and measurement, research scientists at the Educational Testing Service are presently engaged in a long-term computer-based project called The Mastery Assessment System which will combine advanced measurement with computer simulations to challenge students to use higher mental processes and to integrate their thinking skills. Realistic everyday problems or tasks will be presented. The student will need such skills as planning, analysis, synthesis, and evaluation to work through problems. A score for each student will be computer-generated and display a "mastery map" pointing up what the student knows and the thinking competency achieved. Aggregated data for a class or grade will also be obtained as bases for policy decisions at the local level. The refinement of this Project is estimated to take between five and ten years to complete.

Critical Thinking Programs are presently in operation in these selected locations:

South Hamilton, Massachusetts	Shoreham, New York
Elmsford, New York	Peotone, Illinois
Morgantown, West Virginia	Montclair, New Jersey
Costa Mesa, California	El Segundo, California
Mobile, Alabama	St. Clair Shores, Michigan
Bloomfield Hills, Michigan	Detroit, Michigan

Table 2
Selected Leaders In the Critical Thinking Movement

Robin Fogarty Jim Bellanca Illinois Renewal Institute Palatine, Illinois	Kevin O'Reilly South Hamilton, Massachusetts
Lucille Warner Peotone, Illinois	Edward deBono Elmsford, New York
Reuven Feuerstein Baltimore, Maryland	Lee Wincour Costa Mesa, California
Florence Replogle Mobile, Alabama	Stuart C. Rankin Detroit, Michigan
Jerry Applegate Salt lake City, Utah	Claire Heideman St. Louis, Missouri
Charles Wales Morgantown, West Virginia	E. Paul Torrance Sewell, New Jersey
Mathew Lippman Montclair, New Jersey	Mary and Robert Meeker El Segundo, California
Roberto Manzano Alexandria, Virginia	Researchers at the Educational Testing Service Princeton, New Jersey Rosedale Road Princeton, New Jersey
Irving E. Sigel Senior Research Scientist E.T.S.	Ellen Mandinach Director, STACI Project E.T.S.
C. Victor Bunderson Vice President E.T.S.	Joseph Lipson Mastery Assessment Systems E.T.S.

Teacher Effectiveness and Teacher Evaluatuion

The second aspect of this paper will deal with innovations intended to improve teacher qualifications and teacher quality. The charge of incompetency has been hurled at the teaching profession, however unjustly, to the extent that approximately 46 States have enacted tougher training requirements. At issue are grade point averages for

teacher candidates, low scores on various standardized measures such as the National Teacher Examination (N.T.E.), the American College Testing Company (A.C.T.) Achievement Test, the Scholastic Aptitude Test (S.A.T.), and poor performance on a variety of state-developed competency tests for teachers (e.g., in Georgia, the TECAT, Texas).

Roth quotes an E.T.S. report (Focus, 1982) to that effect the teacher education is responsible for the "crisis of incompetence in teaching". In answer to this charge and other criticisms, the Holmes Group, a consortium of education deans and other academic officers from 40 top research universities have developed an innovative proposal for overhauling schools of education. The immediate goals of the proposal are to upgrade professional education and ultimately to improve teacher quality in the classroom. The Holmes Group is named after the late Henry Holmes, dean of the Harvard University Graduate School of Education from 1920-1940.

Five (5) reforms requiring innovation are proposed.

1) Replace undergraduate education with a graduate professional program in teacher education.
2) Enrich the intellectual stature of prospective teachers with a solid background in the liberal arts at undergraduate levels. This implies a fifth or sixth year of study in teacher education programs.
3) Design a three-step career path for classroom teachers: instructor, professional, career professional.
4) Establish professional development schools paralleling teaching hospitals in the medical profession.

5) Require prospective teachers to prove competence in subject matter areas, in writing, in speaking, in lesson planning, and in delivery style.

To be sure, the Holmes Report has met with resistance from traditional colleges of education. As reform proposals go, this is another example of a "decree" from "on high" which, according to Tyler's position will probably not work in the long run. Research, while somewhat meager and contradictory does afford some answers to the Holmes proposals.

Holmes Recommendation #1. (Teacher Preparation)

Usually, regularly certified versus provisionally certified teachers (without education courses) have been studied. Of 13 studies reviewed by Evertson et al, regularly certified teachers ranked higher on student achievement indexes and in formal ratings by principals and other supervisors. In all fairness, it should be pointed out that in many studies of this kind, controls for general academic ability and intelligence were not employed. Furthermore, much of what is learned in education courses does not survive student teaching. Therefore, it is probably better to improve the education curricula and to formalize the body of knowledge that is professional education rather than to abandon undergraduate programs.

Holmes Recommendation #2. (Teacher Expertise)

While it is self-evident that a secondary teacher should be intimately conversant with the body of knowledge in a given speciality, research does not show a consistent pattern of relationships between teacher knowledge/student performance. Knowing does not necessarily make a good

teacher, but it would certainly be better if teachers knew more about the subjects they teach. This recommendation has merit.

Holmes Recommendation #3. (Career Paths)

While there are initiatives from leading universities, state jurisdiction controls teacher certification. It is probably unrealistic to believe that there is "world enough and time" to realize this goal.

Holmes Recommendation #4. (Professional Development Centers)

Already in place are internship programs, "master teacher" programs, and peer reviews. The question of uniformity by States arises.

Holmes Recommendation #5. (Teacher Competence)

Teacher competence remains elusive to solid assessment procedures; research results, contradictory. Selected research conclusions as summarized by Evertson et al are capsuled here:

---Teacher performance does not seem to be related to scores on standardized measures (e.g., N.T.E.).

---Verbal ability (as measured by reputable instruments) appears to be related to teacher effectiveness. Principals generally give high marks to teachers who score well on English tests.

---Principals' ratings of teacher performance are not related to scores on measures of academic aptitude (e.g., A.C.T. or S.A.T.) or on standardized achievement tests.

---Scores on the N.T.E. are positively related to student teacher ratings by university supervisors.

---Relationships between teacher performance and principals' or trained observers' ratings and Grade Point Averages (G.P.A.) are mixed, ranging from a small positive relationship to no linear relationship at all.

---No relationships have been found between the G.P.A. of education and non-education majors and the achievement of students they taught.

---Relationships between N.T.E. scores and student achievement are meager and conflicting.

---Only one study regarding the validity of the N.T.E. was located. No significant relationships were found between teachers' scores and student achievement or supervisors' assessments of teacher performance.

---A meta analysis (65 studies) on the effect of subject matter expertise and teacher effectiveness in science (Druva and Anderson) drew the following conclusions: 1) Education courses, academic performance, and courses in a specialty (science) were positively related to teaching success. 2) There was a relationship between teacher training (in science) and student learning in higher level courses. 3) Conversely, there was a pattern of low correlations (relationships) "across a large number of variables".
This study, formidable in its design, provides some insight into the association of subject matter command and student learning, but should not be interpreted as conclusive.

---Many tests of professional knowledge have been developed at state levels, but few studies demonstrate the power of these tests to predict teacher effectiveness.

Of interest is the Texas Examination of Current Administrators and Teachers (TECAT), a test of basic literacy first administered in 1986. Aside from the political and economic ramifications, this test was intended to raise the image of teachers in public opinion. After two administrations, 90% of 210,000 who took the test passed. Overrepresented among failures were coaches, special education teachers, and shop teachers. A comprehensive study by Shepard and Kreitzer found that teachers agreed that general literacy is essential to good teaching, but were demoralized and threatened by such a low level test. In general, it appeared that the ultimate result was a diminution of public esteem. As it happened, media reports highlighting instances of teacher incompetency in the classroom were associated with teacher fears of taking what actually was a very easy test. Along with this was the enormous cost of initiating and implementing the program. The main purposes of the test were lost somewhere along the way. Clearly, more

valid and reliable measures must be developed. More research is needed if the essence of teacher competence is to be identified.

In the mainstream, as always, E.T.S. has developed an operational plan (to be ready in 1992) for the practical assessment of aspiring teachers. This plan includes two examinations, one given in the sophomore year, and a second, after teacher training plus on-site evaluations of classroom performance. This approach is presently supported by the National Education Association (N.E.A.). To this plan might be added a peer review process in which well-established teachers would weed out poor performers.

In this vein, Ponzio describes a model partnership program called Teacher Inquiry Projects (TIPs) wherein experienced and effective teachers team up with neophytes in small, informal groups to plan instructional strategies, observe, analyze, and evaluate the work of teachers. Research into such partnership arrangements indicates a positive influence on teaching practices, an increase in professional and practical knowledge, in enthusiasm and motivation. Needed is joint released time and in-service assistance in structuring such a program within the school.

Innovations and Evaluation

As with other educational processes, innovatory programs require fair, objective, and global evaluation. Unfortunately, the evaluation component has been a weak link. Many promising programs disappear because of a lack of success evidence to warrant future funding or community support. The classical paradigms for conducting evaluation (e.g.,systems analysis) do not necessarily work for innovative approaches. In Evaluation Studies (Glass, editor), authors Parlette and

Hamilton propose an "Illumination Model". In essence, this Model moves away from the collection of "hard data" to more qualitative measures of effectiveness; description and interpretation are stressed, rather than measurement and prediction as in educational research.

The Illumination Model seeks to judge the "complex reality" of a new program on a very wide spectrum. Instead of a few quantitative measures, this Model suggests that evaluative data be gathered broadly from a variety of sources including the following: 1) Direct, frequent, continuous observations of the behaviors of all participants (administrators, teachers, students, parents) 2) Content analyses of context information (from committee reports, tape recordings, which give clues to the past, present, and future expectations). 3) In depth interviews with a sample of those concerned, especially with top students contrasted with failing students, 4) Cost/benefit analyses. 5) Anecdotal records; impressionistic observations. 6) Systematic arrangement of informal remarks made by students and others. The whole learning milieu must be perceived as a complex network with a wide range of social, institutional psychological, and cultural variables.

Separate efforts must be made to examine constraining variables related to legal problems, administrative restrictions; arrangement of instructions, teacher style and delivery; students' perspectives as recorded in diaries, on check lists or inventories. In summary, the Illumination Model consists of the following phases:

1) Investigators observe, record, and seek to explain changes affected by the innovation.
2) Investigators select certain aspects of a new program for systematic probing.

3) Investigators try to identify principles underlying the enterprise.

This Model is conceived to disentangle the maze of complexities which very often engulf an innovative plan--to separate the significant from the trivial. Furthermore, the Model encourages input from participating contingents--administrators, sponsors, students, and teachers so that their respective human insights will become part of the decision-making process.

To be sure, The Illumination Model contains some of the spirit of Michael Scriven's Goal Free Evaluation Model. Innovative projects must have a well-structured evaluation design decided upon even before the project gets off the ground, otherwise important advances will wash away and soon be forgotten. As pointed out by Parlette and Hamilton no innovation is "teacher or student proof".

Conclusion

Innovative plans relating to the development of student critical thinking skills and teacher effectiveness have been explored. Perhaps the message for both contingents is summarized, in a quotation from Oliver Wendell Holmes:

> There are one-story intellects, two-story intellects, and three-story intellects with skylights. All fact collectors who have no aim beyond their facts are one-story intellects. Two-story people compare, reason, generalize, using the labor of the fact collectors as their own. Three-story people imagine, predict---their best illumination comes from above through the skylight.

Traditional evaluation methods do not necessarily work in the assessment of innovative programs. And evaluation is a sine qua non in any educational endeavor. Paradigms borrowed from other disciplines

hold promise. For example, the ethnographic method from anthropology, cost-benefit analysis from economics, tracing the past for better understanding of the future from history, provide cues for better evaluation. Without comprehensive appraisal of strengths and weaknesses, an innovative plan may only qualify as a fad and is doomed to oblivion. Innovations certainly need to be scrutinized perhaps in the mode of Evaluation Research.

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